## PART III

## Physical Description

### Physical Regions of Washington

On the basis of surface features, Washington may be divided into eight general regions. Agricultural settlement is influenced by factors of topography, climate, soil, forest vegetation and water resources distinctive to each of the physiographic regions. Each has become a different type of farming area as settlers have learned to adapt crops and livestock to the conditions, or have improved limitations through drainage or irrigation.

### Coastal Plains

A narrow, sandy plain with shallow bays, tidal flats, stream deltas and low headlands lies between the coastline and the Coast Range. It extends from the Columbia River mouth almost to Cape Flattery, being widest and lowest in the Grays Harbor and Willapa Bay districts. The climate is mild and damp with a long growing season, but it is too cool, cloudy and wet for most crops. Originally, this area was covered with heavy forests and much is now covered with woodlands. Lumbering and manufacture of wood products is the main industry. Farming is largely of the livestock and dairying type on low uplands and drained areas in the lower Chehalis River Valley. Cranberry growing is important and well-adapted to numerous, boggy areas in the Grays Harbor and Willapa Bay sections. The shallow bays are also used for oyster culture. Fishing is common in the rivers and coastal banks.

### Coast Range

The Coast Range is an uplifted area of sedimentary and metamorphic rocks divided into the Olympic Mountains and the Willapa Hills. The Olympics tower to nearly 8,000 feet in a dome-like structure, carved deeply by rivers. These mountains have the heaviest precipitation in the state. Snowfields and heavy forests cover the mountains. Most of the wilderness area is within the Olympic National Forest and Olympic National Park, being managed for recreation, wildlife and timber. Farm settlement is limited to some foothill river plains and coastal terraces such as the Dungeness and Port Angeles districts along the Strait of Juan de Fuca. Here in the lee of the mountains, rainfall is moderate and irrigation is practiced by some livestock farmers. The Willapa Hills country is wet, heavily forested and carved into numerous narrow valleys. Logging is the main industry, combined with livestock farming in the upper Chehalis River Valley and along the banks of the Columbia River. Wet climate, hilly topography and the difficulty of clearing stump land retards agriculture.

### Willamette-Puget Sound Lowland

A broad lowland, described as a trough or valley, lies between the Coast Range and the Cascade Mountains. The northern part is the Puget Sound Lowland which has been glaciated and occupied by the sea in the lowest section. The continental glacier reached slightly south of Olympia. Under a warming climate it melted and geologists believe it receded about 25,000 years ago, leaving an infertile plain of moraines and outwash gravels, sands and clays known today

as the Puget Glacial Drift Plain. Its rolling surface has numerous lakes and bogs. Most of the major cities--Seattle, Tacoma, Everett, Bellingham and Olympia--have been built on moraines bordering the Sound. Rivers, such as the Nooksack, Skagit, Snoqualmie, White and Puyallup, built up deltas and flood plains over the older gravelly plains. These narrow valleys are more fertile than the older glacial plains and support numerous small dairy, vegetable and berry farms. Most of the gravelly areas are wooded with a second-growth forest and are used for pastures. In the southern part of the Willamette-Puget Sound Lowland, there are two large valleys--the Cowlitz and Chehalis. They drain a low, hilly area with several flat prairies and bottom lands.

Agriculture is handicapped by poor drainage and flooding of the river deltas and plains, by heavy winter rainfall, by cloudy but dry summers, by coarse, gravelly upland soils and by densely wooded land which is costly to clear. Advantages are mild climate and a location close to major markets for farm products such as milk, poultry and vegetables.

Cascade Mountains

The Cascades are a wide and high topographic and climatic barrier which separates western and eastern Washington. The range is made up of sedimentary, igneous and metamorphic rocks which have been carved by glaciers and streams. High, isolated volcanic cones of lava, such as Mt. Adams (12,307 feet), Mt. Rainier (14,408 feet) and Mt. Baker (10,791 feet), appear upon the older Cascade rocks. The Cascade crest varies between 3,000 and 10,000 feet and is higher and more rugged in northern Washington. Roads and railroads have been built across its lower passes in central and southern Washington. The Columbia River has cut a deep gorge and the lowest pass through the barrier. The western slope is wet and heavily forested with Douglas fir. The eastern slope is drier with a less-dense pine forest. Nearly all classified as forest land, most of the area is in Federal ownership in five national forests and Mount Rainier National Park. Tree fruit farming in the eastern slope valleys of Wenatchee, Chelan, Methow, Naches and the Columbia Gorge is most important. Sheep and cattle summer grazing on alpine grasslands is another use. Deep western slope valley bottoms such as the Skagit, Snoqualmie, Nisqually, Cowlitz and Lewis also contain livestock farms. The area is vitally important as a source of timber. Steep terrain, wet climate, short growing seasons and heavy forest vegetation are main handicaps for agriculture.

Columbia Basin

A low plateau of old lava rocks covered with stream and wind-deposited soild extends in a series of plains, ridges, coulees and hills from the Cascades to the eastern Washington border. The area is basin-like in structure, being higher around its margins and sloping inward to low and level central plains. It has been sharply eroded by the Columbia River and its interior tributaries, the Snake, Yakima, Palouse and Spokane Rivers. The basin has sub-areas created by crustal movements and erosion.

The Yakima Folds are a series of hilly ridges extending from the Cascades eastward into the lower part of the basin. The Yakima and Columbia Rivers have cut gaps through the ridges and built up plains in the trought between them. The rich, alluvial plain of the Yakima River is an important irrigated valley.

The Waterville Plateau is a tableland of thin soils overlaying basaltic rock at an elevation of 2,500 to 3,000 feet. It has gorges cut by the Columbia River and ancient glacial outwash streams once flowing in Moses and Grand Coulees. It is too high for irrigation and is used for dryland grain and livestock farming. The high plain is often called the Big Bend country.

The Channelled Scablands is a belt of dry terrain carved by ice-age rivers into a series of coulees. Bare rock is exposed in the coulees. Small plateaus between the old river channels have thin soils used for dryland farming. The Grand Coulee of this region has been developed into a major irrigation reservoir.

The Palouse Hills consist of fertile deposits of wind-blown soil overlaying basaltic lava flows. After being deposited in large dunes, the formation was reshaped by streams into an intricate pattern of low, rounded hills which are tilled for wheat, barley and legumes. The hills receive 16 to 25 inches of rainfall and have deep, porous and fertile soils. It is one of the richest farming areas of the Pacific Northwest.

The Central Plains are low and relatively level expanses of soil, deposited by old streams crossing the Channelled Scablands and later by the flooding of the Yakima, Columbia, Snake and Walla Walla Rivers. Climate is desert-like (6-12 inches of precipitation per year). The lower lands of the area, the Quincy and Pasco Basins and the Walla Walla Valley, are irrigated. Quincy Basin is a new irrigation area watered by Grand Coulee Dam.

Agricultural handicaps in Columbia Basin regions are mainly found in its dry, continental climate. Large irrigation systems built since 1900 have overcome much of the need for water on rich valley and basin soils. Dryland farming in higher areas is practiced widely, although occasional variations in rainfall, lack of snowfall, winter-kill, water and wind erosion inflict damage to field crops and to livestock ranges.

Okanogan Highlands

A portion of the Rocky Mountains, consisting of well-eroded old granites, lavas and sedimentary rocks, extends across north central Washington. These are the Okanogan Highlands, the state's richest mineral area. Summit levels reach 4,000 to 5,000 feet with peaks exceeding 7,000 feet. Prominent north-south valleys are occupied by irrigated tree fruit and livestock farms. These are the Okanogan, Sanpoil, Kettle and Colville Valleys. The Columbia River Gorge through the Okanogan Highlands is occupied by the large man-made lake behind Grand Coulee Dam--Roosevelt Lake. High and wetter portions are forested with pine and larch, and are managed for timber and for livestock ranges by the United States Forest Service and the Bureau of Indian Affairs. Cold winter temperatures, short growing seasons, dry valley climates and distance from markets are farming handicaps.

Selkirk Mountains

The Selkirks, a range of the Rocky Mountain system, extend into the northeast corner of Washington. The rocks are old mineralized granites and metamorphics reaching elevations of over 7,000 feet. The Pend Oreille River Valley

at the base of the Selkirks is an agricultural area of narrow bottom lands settled by livestock farmers. Nearly all of the uplands are in Kaniksu National Forest. While climate is cool and growing seasons are short, the Pend Oreille Valley has an advantage of being closely located to the Spokane metropolitan market area.

Blue Mountains

The Blue Mountains are an uplifted and eroded plateau extending into the southeastern corner of Washington. The strata are mainly ancient crystalline rocks which contain some minerals. The highest point of the mountains in the Washington section is Diamond Peak (6,401 feet), on the divide between the Grande Ronde, Tucannon and Touchet Rivers. These rivers, and the Walla Walla River, have cut valleys into the plateau. Extensive pine forest and grassland areas are in the highlands within Umatilla National Forest, where rainfall is 30 to 40 inches. The Snake River has cut a deep valley and gorge across the lower parts of the mountains. The area is well developed agriculturally around its northern foothills where wind-blown soils are deep and irrigation systems are used. The Walla Walla and Tucannon Valleys are rich grain, legume and livestock areas grown under irrigation and by dry farming. Grazing is an important use of the high lands by livestock ranchers in the upper valleys.

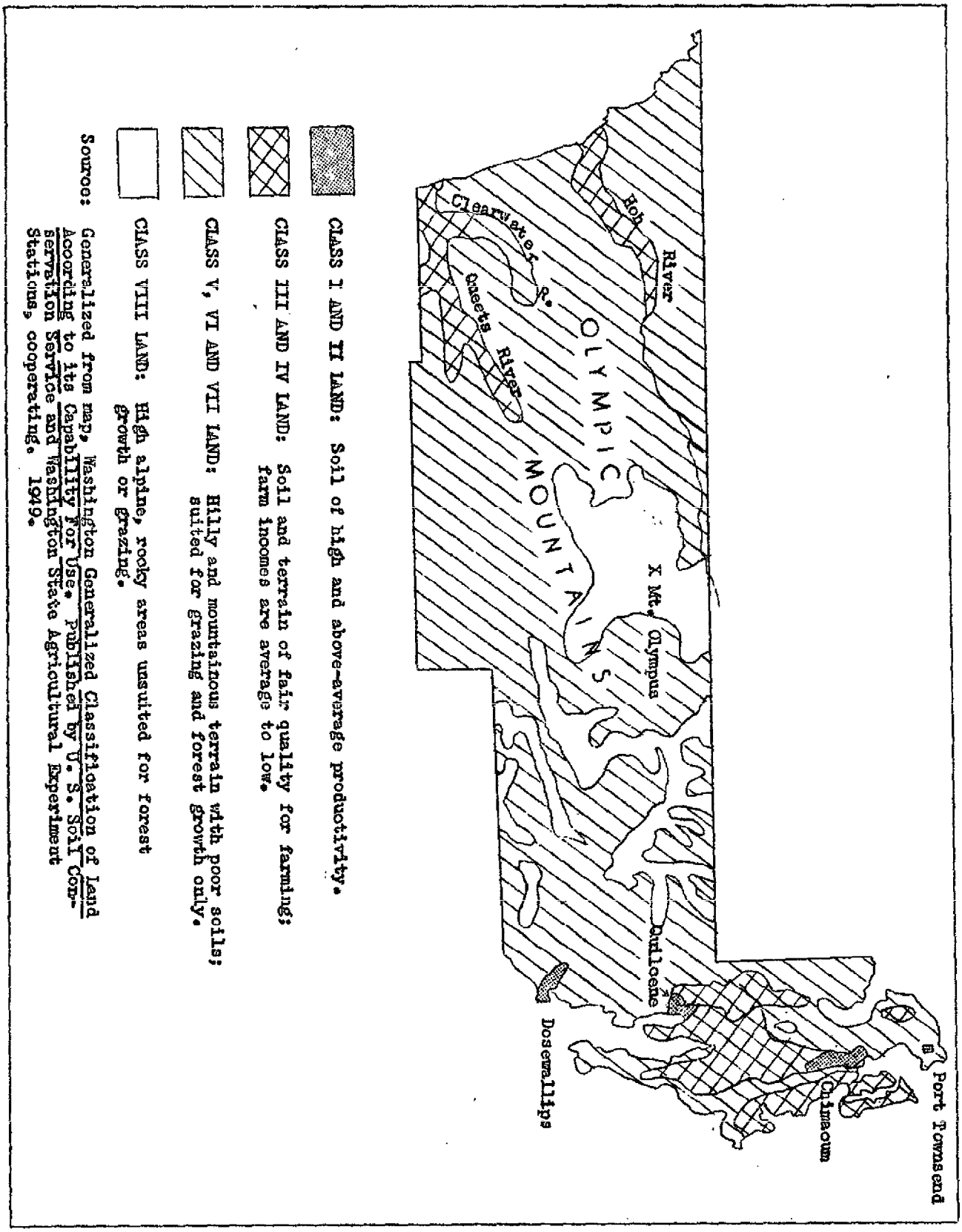
Topography of Jefferson County

The topography of Jefferson County varies from sea level beaches to the alpine peaks of the Olympic Mountains. The county is mainly within the Olympics and contains the range's highest point, Mount Olympus, 7,915 feet above sea level. Primary agricultural areas are the low foothills and river plains of eastern Jefferson County bordering the inland waters of Straits of Juan de Fuca, Admiralty Inlet and Hood Canal. This lowland area is part of the Puget Glacial Drift Plain. Farmland areas in this plain are in the Chimacum Valley, on the delta plains of the Big Quilcene, Little Quilcene, Duckabush and Dosewallips Rivers and the creek valley plains emptying into Discovery Bay and Dabob Bay. Glacial plain hills and the offshore Indian and Marrowstone Islands also are suited for livestock and poultry farming. Foothills south of Port Townsend, west of Port Ludlow and north of Quilcene are between 200 and 600 feet in elevation. Western Jefferson County is generally mountainous and hilly and the coastline is rough and broken. In the west, the Hoh, Clearwater and Queets Rivers descend in deep valleys to the sea and have limited agricultural land along their banks.

Over 90 percent of the county area is hilly and mountainous. Cropland is limited by relief to narrow valley and creek bottom lands in the eastern shoreline area. Topographic conditions have influenced agricultural development toward livestock and poultry raising with woodland and pasture as the principal types of land use.

Land Classification and Soils

Because of its mountainous topography, Jefferson County is divided into eight broad classes of land capability. Stream erosion, sedimentary deposits by glaciers, rivers and tidal currents have created a variety of soil types. The complex soils of the area have not been mapped in detail. Most of the




Source: Generalized from map, Washington Generalized Classification of Land According to its Capability For Use. Published by U. S. Soil Conservation Service and Washington State Agricultural Experiment Stations, cooperating. 1949.

Figure 5.- General Quality of Jefferson County

soils of Jefferson County have been formed under forests and wet climatic conditions. They are leached of minerals by heavy rainfall and generally require fertilization with lime and phosphates to be productive. Drainage is necessary in many of the valley river bottom soils.

Class I and II lands, the best agricultural soils, are localized and limited to the narrow valley lands at Chimacum and the mouths of Quilcene and Dosewallips Rivers. These are river deposited silty and sandy soils carried down from the Olympic ranges. They are wet and require some drainage.

Class III and IV lands classed as fair for general livestock and poultry farming are the most common lands being farmed. These include the glacial sandy and gravelly soils of the Everett series common to the hilly lands and islands bordering Puget Sound and Hood Canal. They were deposited by the Puget Sound glaciers of past geological time. On the low foothills, the Aiken series of soils derived from underlying bedrock and formed under forest cover are quite common. In the west near the coast there are new river deposited soils along the Hoh, Clearwater and Queets Rivers. Melbourne and Aiken soils formed from bedrock of igneous rocks, sandstones and shales, are shallow infertile soils on the hills.

Well over 80 percent of Jefferson County land is rocky and mountainous and consequently is in the nonagricultural classifications of Class V, VI, VII and VIII which are mainly within Olympic National Park and Olympic National Forest. Soil scientists recommend these classes be kept in permanent forest and wilderness recreation use because of their limited capability for agriculture.

## Climate

Jefferson County is located in the West Coast Marine Climatic Region of North America. This climatic zone extends along the Coast from southeastern Alaska to northern California. Climatologists and geographers describe this climate as one influenced by mild moist air flowing in from the ocean. The prevailing west winds of ocean air rising over the Olympic Mountains bring cool, cloudy and wet conditions for about nine months of the year. During the summer the land is warm and the winds from off the ocean are heated and do not drop moisture as frequently as in winter. Thus, there is generally a dry period during July and August with considerable sunshine to mature crops and provide good harvesting conditions for hay and grain.

The lowlands of Jefferson County have a climate similar to other parts of the world located on the west margins of continents in the belt of prevailing westerly winds. These include England, northwestern France, Holland, Denmark and Norway in Europe. In the southern hemisphere, the same mild, cloudy and wet climate is found in southern Chile of South America and in southern New Zealand. In world regional and commercial geography, the countries located in the marine climatic regions are noted for heavy forests which yield lumber and for highly productive dairy farms.

Because of changes in elevation from the low valley and shoreline lands near sea level to the alpine areas of the Olympic Mountains, temperature and rainfall conditions vary considerably. Weather Bureau data from four stations

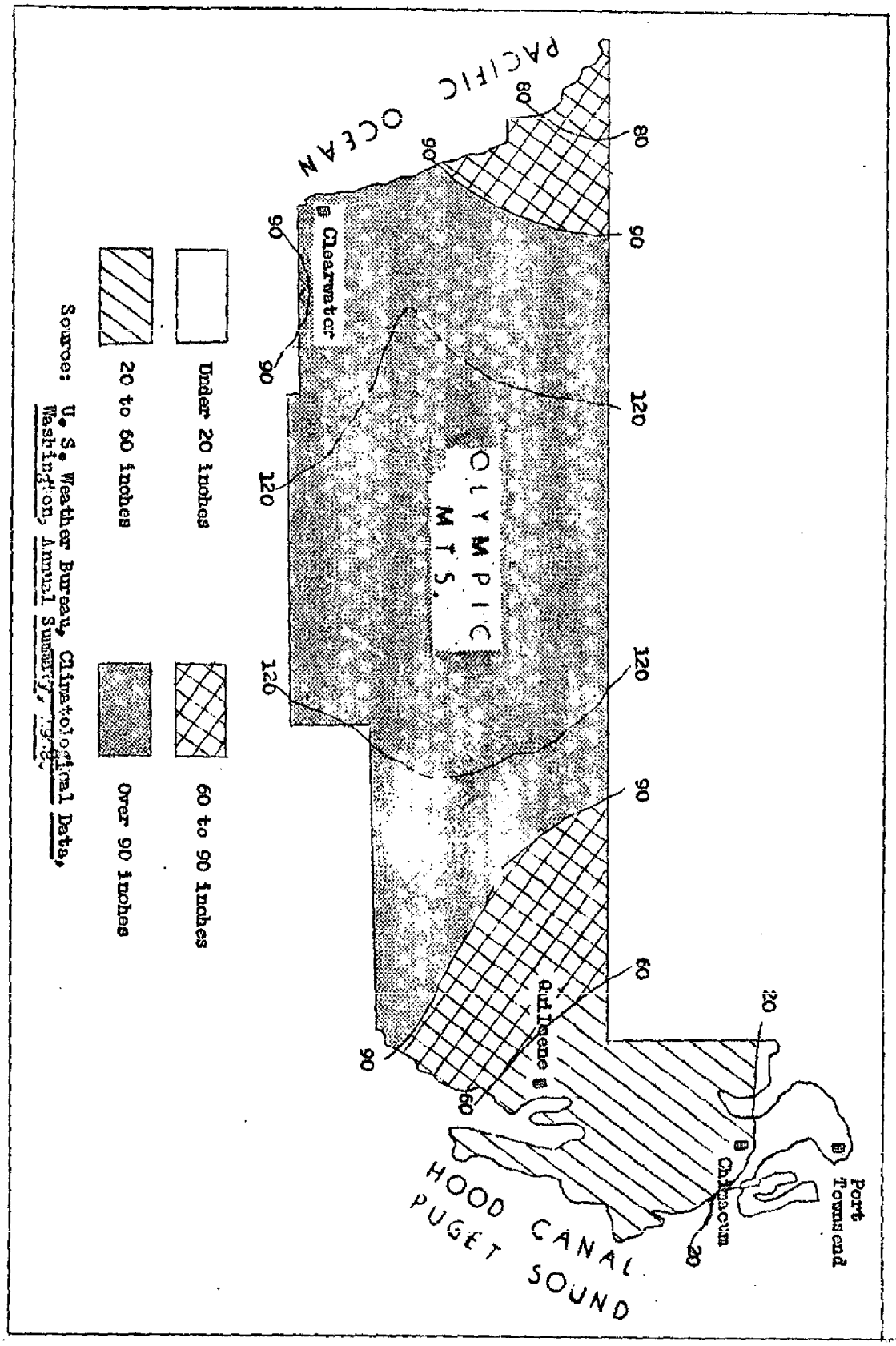



Figure 6.- Distribution of Precipitation
Jefferson County

in the lower elevations indicate a moderate climate without extremes in temperature and a wide range of precipitation conditions. Most of Jefferson County has a mountain climate but its agriculture is nearly all within the Puget Sound lowland type of climate which is milder and drier than in the Olympic Mountains.

Temperature records show that winters in the coastal and Puget Sound lowlands are normally above freezing and that summers are cooler than more inland areas of the state. January averages for a 24-hour day are about 39 degrees at Port Townsend and Clearwater and 37 at Chimacum. Summers are cool, the daily averages for July are 60 to 63 degrees. Temperature extremes are not common or severe in the lowlands. At Port Townsend over a period of 25 years of weather records, the coldest temperature recorded was 3 degrees below zero and the highest has been 99. Agricultural area surrounding Port Townsend, Chimacum and Quilcene receive moderating influences from the inland marine water bodies as well as warm Chinook winds which descend the eastern Olympic Mountain slope.

Table 7.- Temperature Extremes, Dates of Killing Frost
Jefferson County

| Station and Elevation in Feet | Temperature Extremes Recorded (degrees Fahrenheit) | | Killing Frost Average Dates | |
|---|---|---|---|---|
| | Coldest | Hottest | Last in Spring | First in Fall |
| Clearwater (75) | 11 | 100 | April 22 | November 7 |
| Port Townsend (71) | - 3 | 99 | March 9 | November 29 |
| Quilcene (123) | 0 | 99 | April 27 | October 11 |

Source: U. S. Weather Bureau

Table 8.- Precipitation For Selected Stations By Months
Jefferson County

| Station and Elevation in Feet | Average Monthly Precipitation (in inches) | | | | | | | | | | | | Annual Total (inches) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | |
| Chimacum (250) | 2.74 | 2.14 | 2.72 | 1.99 | 1.76 | 1.63 | .58 | .65 | 1.22 | 1.88 | 2.45 | 3.91 | 22.64 |
| Clearwater (75) | 18.10 | 15.13 | 12.82 | 8.05 | 5.82 | 6.13 | 1.71 | 1.13 | 5.81 | 11.42 | 17.77 | 19.33 | 125.26 |
| Port Townsend (71) | 2.10 | 1.58 | 1.52 | 1.17 | 1.36 | 1.49 | .76 | .69 | 1.11 | 1.58 | 2.33 | 2.50 | 18.19 |
| Quilcene (123) | 7.21 | 5.16 | 3.36 | 3.04 | 2.59 | 2.09 | .84 | 1.09 | 1.87 | 4.13 | 5.22 | 9.53 | 47.15 |

Source: U.S. Weather Bureau, Climatological Data, Washington, Annual Summary, 1956

Frost conditions and growing seasons vary from locality to locality but are favorable for agriculture. The eastern shoreline lowlands are generally free of frosts from end of April to end of November, providing normally a growing season of 200 to 250 days in the peninsular and island localities of eastern Jefferson County.

Because of mountainous terrain and varied exposure to the moist prevailing westerly winds, precipitation varies greatly by districts. Stations such as

Clearwater in the western Olympic Mountain slope are extremely wet. Here humid westerly winds leaving the ocean are forced upward over the highlands of the peninsula. The rising air is cooled rapidly, causing heavy annual precipitation of rains in the foothills and snow in the mountains over the western two-thirds of Jefferson County. Precipitation at Clearwater and in the upper valleys of the Clearwater, Hoh and Queets Rivers exceeds 90 inches. In the higher mountains surrounding Mt. Olympus it is estimated to exceed 140 inches.

Conditions on the eastern slope and over Puget Sound lowlands are relatively drier, being on the lee side of the mountains where the westerlies are descending and dropping lesser amounts of moisture. Port Townsend, Indian and Marrowstone Island districts are among the driest localities of western Washington, receiving 18 to 22 inches of moisture. Port Townsend in this drier and warmer belt receives about 18 inches per year and Chimacum has about 23. This localized area has a good climate for poultry. It is necessary to use sprinkler irrigation to get reliable crop and pasture production during the growing season.

Precipitation has a distinct seasonal characteristic. There is a long wet season extending from the beginning of September to the middle of June. A short dry season occurs in August and July. The dry season is sunny and warm and good for hay harvesting, but it usually creates a forest fire hazard.

Table 9.- Temperatures For Selected Stations, By Months
Jefferson County

| Station and Elevation in Feet | Average Temperatures (in degrees Fahrenheit) | | | | | | | | | | | | Annual Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | |
| Clearwater (75) | 39.0 | 42.0 | 43.8 | 47.8 | 52.2 | 56.0 | 60.4 | 60.4 | 57.8 | 51.6 | 54.2 | 41.6 | 49.5 |
| Port Townsend (71) | 39.5 | 43.8 | 44.8 | 49.0 | 52.8 | 57.6 | 60.0 | 61.0 | 58.4 | 51.4 | 52.2 | 43.0 | 50.1 |
| Quilcene (123) | 37.2 | 42.4 | 44.0 | 49.1 | 54.1 | 59.0 | 63.1 | 62.9 | 57.6 | 50.7 | 49.6 | 38.8 | 49.9 |

Source: U. S. Weather Bureau, Climatological Data, Washington, Annual Summary, 1956

## Forests and Wildlife

Jefferson County is rich in forest resources in the Olympic Mountain region. The natural vegetation has been modified in its eastern populated region but remains largely in an undisturbed state in the isolated mountain and coastal regions now within the boundaries of Olympic National Park. Logging and land clearing have removed much of the original heavy timber from the eastern lowlands and foothills. The early logged-off lands of the Hood Canal shorelines, the valleys of the Quilcene, Duckabush and Dosewallips Rivers have become restocked with young timber. In this eastern area, logging operations preceded settlement on farms, by clearing the dense Douglas fir, cedar and hemlock forest cover thus lowering the costs of bringing land under cultivation or into grassland use.

According to a Forest Service survey in 1940, Jefferson County contained 1,020,440 acres of forest land, covering 89 percent of the total land area

within the county. 1/ Of this 833,000 acres were capable of growing commercial timber and the remainder was barren alpine land. The forests were mixed stands of conifers with a total saw timber volume of 24 billion board feet estimated in 1940. Cutting since 1940 has reduced this to about 20 billion board feet. Most of the remaining commercial timber is being reserved as a wilderness area within Olympic National Park and for sustained harvesting in Olympic National Forest.

Forests are composed of five major species of timber. Western hemlock, most common on the humid west slope of the Olympic range, amounts to 10.3 billion board feet. Pacific Silver fir, a higher elevation timber, is second at 5.4 billion board feet. Douglas fir, common on the eastern slope, has been logged extensively and is down to 4 billion board feet. Western red cedar, common on the coast, amounts to 2.3 billion board feet. Sitka spruce, on the coast, is estimated at 1.5 billion board feet.

Over 60 percent of Jefferson County forest land is in public ownership. Federal ownership includes 58 percent of the total forest land. Protected and reserved forest land in Olympic National Park accounts for 43 percent and managed timber lands in Olympic National Forest make up 14 percent. Indian lands managed by Federal government comprise about one percent. State ownership in school lands accounts for 22 percent and county ownership for about 5 percent. The remaining 20 percent is in private ownership, with the greater share in the hands of timber companies and a lesser share held by farmers. Farm woodlands in 1954 amounted to about 25,000. The present logging and lumbering economy derives most of its logs from National Forest land but a considerable amount of the pulpwood comes from woodlands owned by companies and farmers.

Log and lumber production in Jefferson County varied in volume during the 1925-1954 period. 2/ In 1925 there were three mills cutting a total of 45 million board feet per year, but by 1954 six small lumber mills were turning out a total of less than 20 million board feet of lumber per year. There are five sawmills in the Port Townsend area and one mill at Quilcene. A pulp and kraft paper mill at Port Townsend uses pulpwood brought in from the Olympic Peninsula area. Log production in Jefferson County in years preceding 1925 exceeded 500 million board feet per year. Logs from Jefferson County often are rafted to Tacoma, Seattle, Everett and Port Gamble. In 1954 the log cut in Jefferson County for lumber mills and paper factories within and outside the county amounted to 108 million board feet.

In contrast to many counties of America which do not have high mountains, Jefferson County has four life zones. Each of these constitutes a different climatic and biological environment caused by differences in elevation. A

---

1/ U. S. Department of Agriculture, Forest Service, Pacific Northwest Forest and Range Experiment Station. Forest Statistics for Jefferson County, Washington, 1940.

2/ West Coast Lumbermen's Association. 1953-1954 Statistical Yearbook, Portland, Oregon.

journey from sea level at Port Townsend to the summit of Mount Olympus (7,915 feet) is somewhat comparable to one from the Straits of Juan de Fuca to the Arctic Coast of Alaska. There are changes in climate from Temperate Zone to Arctic which result in differences in plants and animals adapted to each zone. The varied zones of plant and animal life and the moss forests of the rainy western slope of the Olympic Mountains are natural features of Olympic National Park.

The varied and rich plant and animal resources of Jefferson County are important to both rural and city families as a source of supplementary income and as natural features which attract a growing tourist trade of vacationers, boaters, fishermen and hunters. According to the Washington State Game Department, Jefferson County is an important sport fishing and hunting area. 1/ Salt water fishing is good in the Straits of Juan de Fuca and Hood Canal and steelhead and trout fishing are major attractions on the Hoh, Queets and Clearwater Rivers on the Coast and the Dosewallips, Quilcene and Duckabush Rivers of the east slope. The Hoh River is one of the state's leading steelhead trout streams, yielding about 1,600 of this species per season. Big game hunting in the foothill and mountain areas outside the boundaries of Olympic National Park yield about 800 deer and 300 elk per season. Numerous rural families gain income from these activities as guides and through charter boat services.

1/ Washington State Department of Game. Game Bulletin, Olympia, Washington. These bulletins published quarterly each year give statistics on hunting and fishing by counties.